

Korea University President Visits Brookhaven National Laboratory

Professor Ki-Su Lee, president of Korea University, visited Brookhaven National Laboratory in May to get a firsthand look at PHENIX, a massive detector used for physics experiments on the early universe. Professor Lee's visit highlighted the important contribution that the Korea Detector Laboratory (KODEL) of Korea University is making to enhance the performance of PHENIX. With special expertise in detector technology, KODEL is producing new components that will be installed in PHENIX over the next several years.

Under the leadership of Professor Lee, Korea University actively promotes innovative research and international relationships. A major proponent for global collaboration in research, Lee stated in his February 2008 inaugural address, "We have to embrace the globalization. Armed with practicality and renovation, we will reach out to set the global standards. To achieve that goal, we have to learn from the past and create new things."

PHENIX is operated by an international collaboration with over 500 scientists and engineers from 68 institutions in 14 countries. It is one of several experiments taking place at Brookhaven's Relativistic Heavy Ion Collider (RHIC), where scientists investigate the nature of nuclear forces as they collide particles traveling at 99.9 percent of the speed of light.

KODEL will manufacture 200 state-of-the-art resistive plate chambers (RPCs) for PHENIX. RPCs are detectors that will be integrated into PHENIX. They are the result of an ongoing collaboration of scientists from several labs and universities worldwide since 1997. The new RPC detectors are expected to be installed and fully operational in PHENIX by 2011.

Under the direction of Korea University Professor Sung Keun Park, KODEL will use the same technologies to produce the RPC detectors for PHENIX as were developed to produce the forward RPC detectors in the Compact Muon Solenoid experimental apparatus at the Large Hadron Collider at CERN near Geneva, Switzerland.

The RPCs will enhance PHENIX's ability to probe the internal structure of protons. Protons have a substructure of quarks, anti-quarks and gluons. Gluons carry the nuclear force binding quarks and anti-quarks together to make protons and neutrons. The RPCs facilitate the selection of the rarest proton-proton interactions so that scientists can study the quark-anti-quark structure of the proton. These phenomena are essential ingredients in the processes that give protons their mass and their spin.

Korea University has participated in the PHENIX experiment for many years. The PHENIX research group at Korea University includes four faculty members, as well as their students and staff. Two Korea University Ph.D. students, Byungil Kim and Kwangbok Lee, and Korea University alumnus Young Jin Kim, a researcher at the University of Illinois at Urbana-Champaign (UIUC), currently work on the PHENIX RPC project at Brookhaven.

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William J. Hughes Technical Center Selected as Historic Aerospace Site

The American Institute of Aeronautics and Astronautics (AIAA) has designated the Federal Aviation Administration's (FAA) William J. Hughes Technical Center as an AIAA Historic Aerospace Site. The AIAA cited the Technical Center for its pivotal role in creating the nation's modern air traffic control system over the last 50 years.

The AIAA officially designated the Technical Center as a Historic Aerospace Site on June 10, in Atlantic City, N.J., in conjunction with the Air Traffic Control Association (ATCA)/FAA/NASA Technical Symposium.

The Technical Center is the nation's leading federal laboratory for the research, development, test and evaluation of air transportation systems. Its world-class laboratories and top-notch engineering expertise put the Technical Center at the forefront of the FAA's challenge to modernize the U.S. air transportation system. It is the primary facility for conducting the research, engineering and integration activities required to support the nation's Next Generation Air Transportation System, known as NextGen.

Since 1958, the Center has served as the core facility for modernizing the air traffic control system and for advancing programs to enhance aviation safety in all stages of flight. Center scientists have been responsible for implementing critical programs, focusing on air traffic management, communications, navigation, airports and aircraft safety.

The nation's air traffic control system operates around the clock, and the Technical Center has provided constant backup and field support 24 hours a day, seven days a week when problems occurred at airports and air traffic control centers,. The Technical Center is the focus and national backup for the nation's traffic alert and collision avoidance system and enhanced traffic management system.

Some early Technical Center highlights include: automation data processing center work to automate air traffic control (1961); the first wake vortex turbulence test by a helicopter (1963); the first operational testing of an automated enroute air traffic control system (1966); the introduction of a visual approach slope indicator (VASI) to provide improved guidance to runways (1966); and the first tower cab mockup to test controller work areas and do airport observations (1972).

Work conducted at the Technical Center has resulted in key aviation advancements in: new technology for air traffic control, air-to-ground communications, weather detection, airport visual guidance, runway safety, aircraft surveillance systems, human factors, airport capacity, tower siting, reduced vertical separation minima, and many other areas.

Historic Aerospace Site (cont.)

The Center contains laboratories, test and support facilities, Atlantic City International Airport, and a noncommercial aircraft hangar in an area that covers more than 5,000 acres. Some unique Technical Center laboratories include air traffic control and simulation facilities, a human factors laboratory, a fleet of specially instrumented in-flight testing aircraft, the world's largest full-scale aviation fire test facility, a chemistry laboratory for analyzing the toxicity of materials involved in a fire, radar test laboratories, a structural panel test facility, and the National Airport Pavement Test Facility.

The AIAA established the Historic Aerospace Sites Program in January 2000 to promote the preservation of, and the dissemination of information about, significant accomplishments made in the aerospace profession. The Technical Center joins these impressive sites recognized by the AIAA Historic Sites Committee: the original Bendix Aviation Company in Teterboro, N.J.; the Boeing Red Barn in Seattle; Kitty Hawk, N.C.; the site of the first balloon launch in Annonay, France; and Tranquility Base on the moon. For more information about AIAA's Historic Aerospace Sites Program, contact Emily Springer at (703) 264-7533, or at emilys@aiaa.org.

The AIAA advances the state of aerospace science, engineering and technological leadership. Headquartered in suburban Washington, D.C., the Institute serves more than 35,000 members in 65 regional sections and 79 countries. AIAA membership is drawn from all levels of industry, academia, private research organizations and government. For more information, visit <http://www.aiaa.org>.

Soldiers Select Four Picatinny Inventions as Best of 2007

The Army honored four weapons development teams based at the Armament Research, Development and Engineering Center (ARDEC) at Picatinny Arsenal, New Jersey, by presenting each a highly coveted Top 10 Army Greatest Inventions of the Year Award for 2007 on June 12. The awards were presented during a luncheon ceremony in Arlington, Virginia.

In an April 25 letter, Gen. Benjamin S. Griffin, commanding general of the Army Materiel Command, announced that four Picatinny research and development teams would be recognized for their commitment to improving readiness and their innovative technologies that have a positive impact on soldiers.

Nominations were submitted from across the Army laboratory community and evaluated by soldier teams from the Training and Doctrine Command and Army divisions. "The Army's greatest inventions are chosen by our customers - soldiers who use the equipment in war zones and whose lives depend upon having the best equipment," said Dr. Joseph A. Lannon, ARDEC director. "There is nothing more satisfying and motivating to our workforce than knowing they have made a difference to our soldiers on the battlefield."

Picatinny items on this year's list are the Objective Gunner Protection Kit, XM982 Excalibur Precision Guided Extended Range Artillery Projectile, M110 7.62-mm Semi-automatic Sniper System (SASS), and the Picatinny Blast Shield for the Light Armored Vehicle.

Objective Gunner Protection Kit

The Objective Gunner Protection Kit is an integrated armor and ballistic glass turret that is mounted atop tactical and armored vehicles. Its purpose is to provide 360-degree ballistic protection while retaining visibility for situational awareness by gunners without compromising system effectiveness, reliability and lethality.

The design configuration provides protection in the frontal area, which protects the gunner in critical areas that are typically vulnerable to improvised explosive device fragmentation and enemy small-arms fire.

More than 8,000 Objective Gunner Protection Kits were fielded in fiscal year 2007 in support of Operations Iraqi Freedom and Enduring Freedom.

Four Picatinny Inventions (cont.)

XM982 Excalibur Precision Guided Extended Range Artillery Projectile

Excalibur is the first global positioning system and inertial-guided artillery projectile with 155-mm cannon artillery precision-guided, extended range capability.

It provides revolutionary accuracy compared to all other conventional artillery projectiles.

In conjunction with other battlefield systems, Excalibur provides the Army warfighter with unmatched precision and lethality for artillery projectiles. This is critical to urban warfare where the risk of collateral damage is extremely high.

M110 SASS

The M110 SASS is a 7.62 by 51-mm caliber, semi-automatic, shoulder-fired, direct-line-of-sight weapon system that is capable of delivering rapid-fire precision on targets.

The SASS provides suppressed, rapid-fire precision lethality against personnel targets and light-materiel targets with high-capacity, ammunition-configurable, quick-change magazines and a greater shooter focus on engagements.

Picatinny Blast Shield for Light Armored Vehicles

More than 150 Picatinny Blast Shields were fielded in fiscal year 2007 for the Marine Corps Light Armored Vehicle, or LAV-25, in Operations Iraqi Freedom and Enduring Freedom.

The Picatinny Blast Shield has direct application to the vehicle commander hatch station of the LAV-25 to protect the vehicle commander from small-arms fire and fragmentation resulting from explosive devices.

The Picatinny Blast Shield for the LAV-25 allows the vehicle commander to perform missions under constant flank protection and also enables full visibility and complete weapons integration.

Since the Army Greatest Inventions program began in 2002, Picatinny teams have won 17 of a possible 60 Army greatest invention positions—more than any other Army laboratory or organization.

"We have been successful in winning many of these awards because of our great teaming with our life cycle management commands and their program management offices," Lannon said. "These are truly team efforts and team awards."

Saltwater Sleuths: NOAA Researchers Seek Clues in Unusual Places to Help Determine the Ages of Fish and Shellfish Populations

Fishery biologist Sandy Sutherland looks through the lens of the microscope at tiny sections of fish earbones, known as otoliths, each showing annual bands of growth. She carefully counts the bands to determine the age of the fish, then moves on to the next sample. Known as an age reader, Sutherland is one of a small team at the National Oceanic and Atmospheric Administration's (NOAA) Northeast Fisheries Science Center (NEFSC), whose aging work is critical to stock assessments needed to manage the nation's fishery resources in the northwest Atlantic Ocean.

Year after year, she and colleagues age tens of thousands of samples. They come from many sources: shell samples from surfclams, otoliths from several dozen fish species, vertebra from monkfish, and scales from summer, winter, and yellowtail flounder.

"Age reading requires a lot of patience," said Jay Burnett, a fishery biologist who joined NEFSC in 1982 in the stock assessment group and now heads the Fishery Biology Program within NEFSC's Fisheries and Ecosystems Monitoring and Analysis Division. "This has been a very busy year. In 2008 we will read more than 100,000 samples."

The aging team works in the "Cottage", a Cape Cod-style house along the Woods Hole, Massachusetts, waterfront which once served as home to the laboratory's directors. Boxes full of samples arrive at the Cottage each week. About 60 percent of the samples are from commercial fish that are landed in ports from Virginia to Maine. About 30 percent of the samples are from the Center's own research surveys, and about 10 percent come from the Northeast Fishery Observer Program, which places samplers directly on commercial fishing vessels. A fraction of the samples come from recreational fishing and the NOAA Fisheries Cooperative Research Program.

"Some fisheries are very seasonal, so samples vary," Burnett said. "Commercial samples will come from fish that have a market value and are caught in certain areas where fishermen know they will find them. Survey samples come from sampling in many areas. Observer program samples come from a variety of targeted commercial species and bycatch, or unwanted species that are not landed."

Burnett says the samples from the different groups provide a range of sizes and ages, and include species that are both commercially fished and those that are not, making it a good representation of what occurs in nature. Age estimates are based on visible growth increments that are deposited annually, much like tree rings.

Otoliths are the most common hard part used for aging species and are read whole, baked and broken, or sectioned. Wherever possible, fish scales are impressed in laminated plastic for aging, which is very cost-effective because there is little processing necessary to collect and process scales. Some species, however, require special attention. Baked vertebrae are used to age monkfish, and thin sections of chondrophores, a cavity at the hinge of bivalve mollusks, are used to age surfclams.

Saltwater Sleuths (cont.)

The majority of requests for age data come from stock assessment teams, and others from state fisheries agencies and other nations. Given the demand for age data, the NEFSC laboratory analyzes more samples than any other NOAA fisheries laboratory or state fisheries program in the northeast U.S., partly because many agencies don't have enough qualified readers or have abandoned their aging programs.

Burnett emphasizes that quality control and quality assurance measures are critical to the group's success. When counting annual rings, "you have to validate that one year is really one year, and that everyone is reading the samples in the same way so there is a high degree of accuracy in the data you provide."

To maintain the quality of the data and a high level of precision or repeatability in age reading, the program has assembled a reference collection of known age samples. Annual exchanges for quality control and precision for cod and haddock age reading are conducted with Canadian colleagues. Readers are also checked against others in the group. Other quality control measures are used to evaluate accuracy and precision, while validation of aging methods includes recapturing tagged fish and measuring naturally occurring isotopes or bomb radiocarbon in longer-lived fishes.

Age reading has an official name—sclerochronology, which is defined as the study of periodic increments in skeletal organisms like shells, scales, otoliths and vertebra. While it is not as well known to the public as dendochronology, the study of tree rings used to determine age and environmental changes, sclerochronology has become an increasingly important tool in the marine sciences.

Sclerochronology can reconstruct the life history and environmental conditions preserved in fossil skeletons, such as daily banding in coral reef skeletons and annual growth rings in mollusk shells. Growth patterns can reflect monthly, fortnightly (every two weeks), tidal and even daily increments of time. The first known reliable age estimate of a fish occurred in 1759, but it was not until the end of the 19th century that the art of age estimation was rediscovered.

Burnett says the aging program began at the NEFSC in the 1940s with haddock and yellowtail flounder scales but really picked up steam in the 1960s. Today the group is among the most active in the nation, providing age data for stock assessments not just for NEFSC, but also for the Commonwealth of Massachusetts and several other states, as well as for Canada's Department of Fisheries and Oceans, since some stocks straddle political boundaries. Other U.S. environmental agencies, such as the Environmental Protection Agency (EPA), and academic scientists seek the expertise of this group as well, or seek access to the several decades' worth of archived samples.

Saltwater Sleuths (cont.)

The responsibilities for age samples and data, and the declining number of organizations that have age readers keep the group busy. Each winter, samples from cod, haddock and yellowtail flounder on Georges Bank are analyzed for the Transboundary Resource Assessment Committee, or TRAC, which provides the assessments necessary to manage the shared resources of the U.S. and Canada in the Gulf of Maine-Georges Bank region.

Between 12,000 and 15,000 samples will be analyzed for the annual summer flounder assessment. Twice a year, several thousand samples are analyzed for stock assessment review committees, known as SARCs, which focus on specific species.

The 2008 Groundfish Assessment Review Meeting (GARM), a series of four meetings culminating in August at NEFSC headquarters in Woods Hole, will review the status of 19 managed groundfish stocks; 13 will require age data. Burnett says his group planned to analyze about 100,000 samples by June 1 for the GARM, significantly more than the 72,500 age samples analyzed for the last GARM in 2005, which also covered 19 managed stocks.

Ninety-five percent of the group's work is done for stock assessments, and the remainder is for research. Production aging, as the stock assessment work is called, uses an established methodology and applies it to thousands of samples. It is a skill that takes time to acquire. Burnett has been aging samples for 22 years, Sutherland for four years. Other team members have between four months and 27 years of experience aging samples. Given the demand by the 2008 GARM for production aging, research aging has not been a major focus this past year; however, this is something the group plans to return to soon.

"You can't estimate fishing mortality and be able to say anything reliable about stock status unless you know the demographics of the various populations," Burnett said of the importance of age data. "It is like the local school department needing to know the ages of students to plan for the future. It is the basis of everything."

Brookhaven Scientists Explore Brain's Reaction to Potent Hallucinogen

Brain-imaging studies performed in animals at Brookhaven National Laboratory provide researchers with clues about why an increasingly popular recreational drug that causes hallucinations and motor-function impairment in humans is abused. Using trace amounts of *Salvia divinorum*—also known as "salvia," a Mexican mint plant that can be smoked in the form of dried leaves or serum—Brookhaven scientists found that the drug's behavior in the brains of primates mimics the extremely fast and brief "high" observed in humans. Their results are now published online in the journal *NeuroImage*.

Quickly gaining popularity among teenagers and young adults, salvia is legal in most states, but is grabbing the attention of municipal lawmakers. Numerous states have placed controls on salvia or salvinorin A—the plant's active component—and others, including New York, are considering restrictions.

"This is probably one of the most potent hallucinogens known," said Brookhaven chemist Jacob Hooker, the lead author of the study, which is the first to look at how the drug travels through the brain. "It's really important that we study drugs like salvia and how they affect the brain in order to understand why they are abused and to investigate their medicinal relevance, both of which can inform policy makers."

Hooker and fellow researchers used positron emission tomography, or PET scanning, to watch the distribution of salvinorin A in the brains of anesthetized primates. In this technique, the scientists administered a radioactively labeled form of salvinorin A (at concentrations far below pharmacologically active doses) and used the PET scanner to track its site-specific concentrations in various brain regions.

Within 40 seconds of administration, the researchers found a peak concentration of salvinorin A in the brain—nearly 10 times faster than the rate at which cocaine enters the brain. About 16 minutes later, the drug was essentially gone. This pattern parallels the effects described by human users, who experience an almost immediate high that starts fading away within 5 to 10 minutes.

High concentrations of the drug were localized to the cerebellum and visual cortex, which are the parts of the brain responsible for motor function and vision, respectively. Based on their results and published data from human use, the scientists estimate that just 10 micrograms of salvia in the brain is needed to cause psychoactive effects in humans.

Salvia doesn't cause the typical euphoric state associated with other hallucinogens like LSD, Hooker said. The drug targets a receptor that is known to modulate pain and could be important for therapies as far-reaching as mood disorders.

Brookhaven Scientists (cont.)

"Most people don't find this class of drugs very pleasurable," Hooker said. "So perhaps the main draw or reason for its appeal relates to the rapid onset and short duration of its effects, which are incredibly unique. The kinetics is often as important as the abused drug itself."

The Brookhaven team plans to conduct further studies related to salvia's abuse potential. The scientists also hope to develop radioactive tracers that can better probe the brain receptors to which salvia binds. Such studies could possibly lead to therapies for chronic pain and mood disorders.

This research was funded by the National Institutes of Health and the Office of Biological and Environmental Research within the Department of Energy's (DOE) Office of Science. DOE has a longstanding interest in research on brain chemistry gained through brain-imaging studies. Brain-imaging techniques such as PET are a direct outgrowth of DOE's support of basic physics and chemistry research.

All research involving laboratory animals at Brookhaven National Laboratory is conducted under the jurisdiction of the Lab's [Institutional Animal Care and Use Committee](#) in compliance with the Public Health Service (PHS) [Policy on Humane Care and Use of Laboratory Animals](#), the Department of Agriculture's [Animal Welfare Act](#), and the National Academy of Sciences' [Guide for the Care and Use of Laboratory Animals](#). This research has enhanced the understanding of a wide array of human medical conditions, including cancer, drug addiction, Alzheimer's and Parkinson's diseases, and normal aging, and it has led to the development of several promising treatment strategies.

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2008 Northeast Region Awards – Call for Nominations

The Northeast Region is now accepting nominations for its 2008 awards. The deadline to submit nominations is Monday, June 30, 2008, and the awards will be presented at the Northeast regional meeting in Upton, New York, in September 2008.

Awards will be presented in the following categories:

- ***Regional Coordinator's Excellence Award***—Presented to the FLC Laboratory Representative or Alternate in recognition of the individual's significant contribution to the FLC program during the past year. The individual selected for this award will be the Northeast Region's nominee for the national FLC Representative of the Year Award.
- ***Regional Laboratory Award***—Presented to a federal laboratory within the Region in recognition of extraordinary efforts, which exceed legislated requirements, in the furtherance of national and regional technology transfer activities.
- ***Regional Appreciation Award***—Presented to any individual, not a direct employee of a government-owned and operated (GOGO) or a government-owned, contractor-operated (GOCO) organization, who has made a significant contribution to the federal technology transfer program. The act, effort, or support must have been for the primary purpose of promoting and/or extending technology transfer from the federal laboratory system to nonfederal entities. The individual selected for this award will be the Northeast Region's nominee for the national FLC Outstanding Service Award.
- ***Industry/Nonfederal Government/University Award***—Presented to an American-owned company, a nonfederal government entity, or a university within each FLC region that has made outstanding efforts to promote either the actual transfer of federal technology transfer or the federal technology transfer program during the 12 months preceding the nomination.
- ***Excellence in Technology Transfer Award***—Presented to laboratory employees who have accomplished outstanding work in the process of transferring federally developed technology to the marketplace. The winners of this award will be the nominated for the national FLC Award for Excellence in Technology Transfer.

The 2008 FLC Northeast Region awards package, which contains additional information on the awards and nomination forms, is available online at www.flcnortheast.org/awards.html.

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Technical Center Hosts FLC

The FAA's Technology Transfer Program, based at the William J. Hughes Technical Center, hosted the FLC Executive Board and Northeast Region meetings February 21-22. This was the first time both the Executive Board and the Northeast Region met jointly at the Technical Center.

A welcome reception kicked off activities at the Marriott's Seaview Golf Resort on the evening of February 20. Consortium members enjoyed the opportunity to unwind, get acquainted, meet new members, and rekindle old working friendships.

The first morning, the Executive Board met separately to discuss Consortium policy issues, the agenda for the upcoming May national meeting in Portland, Ore., and other national matters. Northeast Region members met to discuss issues related to their chapter and region. The two groups joined for lunch, then toured both the Technical Center's flying laboratories in the hangar, and the Center's Research, Development and Human Factors Laboratory. After the tours, the groups joined to discuss FLC-related issues.

The second day focused on homeland security. The Executive Board and Northeast Region met with the New Jersey Regional Homeland Security Task Force at the Department of Homeland Security's Transportation Security Laboratory. Presentations were given about state homeland security issues and their relationships with federal laboratories. The groups then toured the security laboratories to view technologies dealing with personnel screening – trace, backscatter and millimeter wave portals; trace tabletop and portable screening; explosive simulants; bulk research in x-ray diffraction; human factors studies; and the latest technologies for detecting explosives in checked and carry-on luggage.

"We were delighted to host the FLC's Executive Board and Northeast regional meetings, along with the state's Homeland Security Task Force," said Deborah Germak, FAA Technology Transfer Program Manager. "The meeting provided the perfect forum for all parties to exchange valuable information and for the Technical Center to showcase our fabulous facilities and unique capabilities."

More than 250 federal laboratories comprise the FLC, with 29 member laboratories in the Northeast Region.

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Save the Date: Fall 2008 Regional Meeting

The next Northeast regional meeting will take place September 15–17, 2008, at Brookhaven National Laboratory (BNL) in Upton, N.Y. Join us for three days of networking, discussions about technology transfer issues, laboratory tours, and entertaining social events.

Topics that will be presented at this meeting include:

- Small Business Perspective of Technology Transfer with National Labs
- Department of Energy Technology Transfer Update
- Overview of Department of Homeland Security Labs in the Northeast Region
- Technology Focus – Veterans Administration

The technology transfer efforts at BNL will be examined firsthand with tours to the Center for Functional Nanomaterials, the PET Imaging Laboratory, and the Radiation Detector Testing and Evaluation Facility (RADTEC).

Another meeting highlight will be the presentation of the 2008 Northeast regional awards, which will recognize the outstanding accomplishments of regional laboratories in transferring technologies.

There will also be several opportunities to have fun as well, including a reception and tours to local points of interest.

The official hotel of the Northeast regional meeting is the Inn and Spa at East Wind in Wading River. Sprawled on 25 private acres, The Inn and Spa at East Wind is the crown jewel of Long Island's prestigious North Shore.

More information on the meeting and hotel reservations will soon be available online at www.flcnortheast.org.